

NUCLEAR MAGNETIC RESONANCE STUDY OF THE TYPES OF POLYVINYL CHLORIDE PLASTICIZATION*

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(Received 16 August 1965)

THIS work is a continuation of previous work [1, 2] in which the plasticization of polymers was studied by nuclear magnetic resonance (NMR). It intends to try to explain the nature and physical meaning of various types of PVC plasticization.

Other studies [3, 4] had shown that two types of plasticization existed, the intra- (or molecular) and the inter-spherulitic (or structural). This conclusion had been reached on the basis of the effects of plasticizers on the various physico-mechanical properties of polymers, chiefly using the glass temperature (T_g) changes as a function of concentration. All the plasticizers could, accordingly, be divided into three types, namely the two mentioned above and an intermediate (or mixed) [5] plasticization.

It was found [6] that the same plasticizers could produce inter- or intra-spherulitic plasticization. Another paper [7] reported findings of interspherulitic plasticization also reducing T_g at low concentrations. It is thus impossible to separate inter- from intra-plasticization in the range of low plasticizer concentrations on the basis of activity.

Where a much larger concentration of an intra-spherulitic plasticizer is introduced, the latter will not reduce the T_g any further and this will prevent any distinction to be made on the basis of T_g changes between a molecular plasticizers and a mixture of a polymer with an excess of plasticizer.

The mechanism of plasticization could thus not be studied in certain cases from its effect, although this is otherwise a very suitable practical characteristic.

The parameter characterizing the mechanism of plasticization, used in this work, was the mobility of the plasticizer molecules. This mobility, which is a molecular characteristic of the liquid phase of a plasticized polymer and a value equivalent to kinetic energy, has a considerable influence on such important factors as the compatibility (miscibility), effect and period of activity [8]. The

* Vysokomol. soyed. 8: No. 10, 1810-1813, 1966.